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## A CONTRIBUTION TO THE ICHTHYOLOGY OF ALASKA.

BY EDWARD D. COPE, A. M.

(Read before the American Philosophical Society, January 17, 1873.)

Prof. George Davidson of the United States Coast Survey, while engaged in the prosecution of his duties off the coast of the Territory of Alaska, made a collection of the species of fishes he observed at several points. The principal localities where he collected were at Sitka and Unalaska. The number of species is only sixteen, but they embrace an unusual proportion of novelty, as the ichthyology of the region has been but little examined. The additions to the science are of interest, and such as to encourage the hope that the officers of the Survey will frequently devote their attention to the natural history of regions to which their duties may call them.

## HOLOCEPHALI.

HYDROLAGUS COLLEI, Bennet.

Beechey's Voyage, p. 71 (*Chimæra*), *Hydrolagus*, Gill.

## ISOSPONDYLI.

SALMO TUDES. Cope, sp. nov.

Group of *Salvelini*, *i. e.*, with teeth on the anterior part only of the vomer; a median series of teeth on the posterior basihyal bones, and a series on each side of the glossohyal. The vomerine teeth are small; those of the maxillaries, dentaries, and palatines are numerous and small.

Form moderately stout, head quite small, conic, with wide frontal region and small eye. Head five times in total length (including caudal fin); eye seven times in length of head, nearly three times in interorbital width. Front nearly straight and descending in profile, convex transversely, and with a weak carina, sometimes scarcely discoverable. Muzzle narrow, acuminate, slightly concave at the extremity to receive a small knob-like projection of the symphysis of the mandible. Maxillary bone narrow, extending a little beyond the line of the posterior margin of the eye. Radii, Br. 11; D. I. 11; A. 10. Caudal fin openly forked; pectorals rather elongate, extending more than half-way to the basis of the ventrals. Depth of body a little less than length of head. Scales: l. l. 119; those of lateral line larger than the other scales. Total length, fourteen inches.

Color steel-black above, yellow (in alcohol) below the lateral line. Rather numerous white (red?) spots about the size of the pupil of the eye above the lateral line, arranged more or less quincuncially. They also appear below the lateral line above the pectoral fin. Head black above, sides bluish, fins unicolor.

Two specimens from the island of Unalaska, taken at "Captain's Harbor."

This trout, or char, is allied to the species described by Pallas (*Zoographia Rosso-Asiatica*, vol. iii). from the eastern parts of Siberia and the Kurile Islands. It is especially comparable to the *Salmo leucomænis*

and the *S. curilus*, especially in the rounded or oval outlines of the opercular bones. From the former it differs in the larger head, much longer pectoral fin, larger scales, &c.; from the latter in the absence of spots below the lateral line, absence of "two tubercles on the upper jaw," stouter form, &c.

SPRATTELLOIDES BRYOPORUS. COPE, sp. nov.

Form compressed and moderately elongate. Belly rounded, except between ventral fins and vent, where it is angular. Head five times in length to end of scales at basis of caudal fin; depth 4.5 times in the same. Eye 4.75 times in head, measuring without regard to vertical palprebæ. Maxillary bone broad, flat, extending to beneath the middle of the pupil. Pectoral fin 2.5 times in the space between the base and that of the ventral fin. Latter originating opposite a point a little in front of the middle of the dorsal. Radii, D. I. 18; A. 18; scales l. tr. 12; l. l. 51. Anal radii short; ventrals rather short. Length, fourteen inches.

General color golden; the dorsal region dark, with blue reflections.

The vertex of the head is occupied by a bifurcate depression, which is occupied by a transparent thickening of the epidermis, which is filled with delicate branching mucous tubules in great numbers. Opercular and post-frontal regions filled with delicate, elongate mucous tubes. Coast of Alaska. The first species of the genus of herring from the Northern Pacific Ocean.

HEMIBRANCHII. \*

The position of the *Pegasidæ* has been for a long time a matter of discussion, and without important result. Günther, the latest writer, places them in the *Physostomi* near the *Lophobranchii*; the older authors had regarded them as belonging to the latter order. Steenstrup as quoted by Kner (Sitzungsber. Akad. Wiss. Wien, xli., p.p. 821-22), thinks them near to *Aspidophorus*, which is one of the *Scyphobranchii*. I am sure that the reference to the *Hemibranchii* is a step in advance of previous conclusions, and for the following reasons:

The characters which distinguish *Pegasus* most widely from *Aspidophorus*, are the following: The ventral fins are abdominal, the interclavicles are present; the first and fourth superior branchiyls are wanting; the branchiostegal rays are nearly wanting, the centra, neural arches and spines of the dorsal vertebrae are suturally united. It agrees with the *Hemibranchii* in all of these characters except in the presence of but one branchiostegal; but these are reduced in number in both

\* In the Transactions of the American Philosophical Society 1871. 457 an account of the osteological characters of the two orders of eels, *Enchelycephali* and *Colocephali*, is given. Under the head of the former, the *Congridæ* and *Anguillidæ* are included, while a third is added, the "*Gymnothoracidæ*." This is now omitted, for it is synonymous with the *Muraenidæ* of the succeeding order, as the characters given show. Its presence out of place, is probably the result of a clerical mistake in not eliminating it from a previous MS., written before the distinction between the orders *Enchelycephali* and *Colocephali* was recognized. As it was inserted under the latter head, its omission from the former was to be understood.

In that essay it is also stated, that the suboperculum is wanting in the *Ostracidæ*. In some of my specimens this is the case; in others it is present, but is a very thin lamina, easily lost.

*Hemibranchii* and *Lophobranchii*. It agrees with the former, also, in the development of the premaxillary bone over the whole arc of the mouth, and the reduction of the superior pharyngeals to one, the third. The undivided, sessile post-temporal, and simple basis cranii are characters of the *Hemibranchii*. The absence of anterior dorsal fin is in many of them, as is also the enlargement of the anterior vertebræ, and the sutural interlocking of the centra, and union of the plate-like neural spines. The presence of a strong third superior pharyngeal bone, and the superior branchiyls with the laminiform branchial processes, separate the genus from the *Lophobranchii*.

Thus this genus, whose true systematic position has been so long doubtful, appears to be nearer to the *Hemibranchii* than to any other order. But there are some features in which it differs from these also. The scapula is horizontal instead of vertical, throwing the superior margin of the pectoral fin to the level of the inferior rays, and behind them. The fin is thus horizontal and on the plane of the abdomen, instead of occupying the universally elevated position seen in *Hemibranchii*. By this arrangement, the coracoids become horizontal, and they are also entirely transverse, enclosing the branchial cavity behind. The interclavicles are narrow, and attached to their inferior surface. A more important difference is seen in the opercular apparatus; the inter and sub-opercular are not distinguishable from the operculum.

Thus there is a remarkable range in the production of the mouth in this series. In *Pegasus* inferior, in *Gasterosteus* terminal, and in the three remaining families very much produced.

The *Pegasidæ* suggest the connection of this order to the *Scyphobranchii* through the *Aspidophoridae*. In the latter the single basin-shaped third superior pharyngeal is similar (but the superior branchiyls are present); the post-temporal is coössified, and though furcate is roofed over by bone. The femora are roof-shaped, and the sub-operculum much reduced.

GASTEROSTEUS ACULEATUS, L., var. *trachurus*.

From Alaska, closely resembling specimens of the same variety from Godhavn, Greenland, brought by Dr. I. I. Hays, but with rather longer head and more slender dorsal spines.

#### PERCOMORPHI.

##### *Aspidophoridae*.

ASPIDOPHORUS ACCIPENSERINUS, Pallas.

##### *Cottidæ*.

BLEPSIAS BILOBUS. Cuv. Val.

Said to have been caught in flying over an Indian's canoe off Sitka; the great development of the pectoral fins renders it quite probable that this species can make short flights. Deposited in the Academy of Natural Sciences by Dr. John B. White.

BLEPSIAS CIRRHOSUS. Cuv. Val.

Alaska.

*Blenniidae.**XIPHIDIUM CRUOREUM.* Cope, sp. nov.

Depth, 9.5 times into total length; length of head, 8.25 times in the same. Eye one-seventh of length of head, about equal to the length of the pectoral fin. Teeth, two canines above, four below, sub-equal. Radii, Br. 5; D. near 70; A. 48. The dorsal spines do not commence near the head, and the anterior are buried in a soft fold of the skin. Caudal fin not distinct. There are three lateral mucous canals extending the entire length to the caudal fin, which have numerous alternating transverse branches; those of the superior, reaching the base of the dorsal, the inferior the base of the anal fin. Each of these cross branches has several excretory pores, which are wanting on the main stem. A similar but short tube extends from near the basis of the dorsal fin to the supra-occipital region, and does not branch anteriorly. The superior lateral canal descends to near the median, but does not join it, nor does the latter extend into the inferior. There is another tubular line on each side of the abdomen. These unite on the jugular region by a continuation of the inferior lateral tube. The vent is nearer the end of the muzzle than the end of the caudal fin, by the length of the head.

Length, eight inches.

Color, maroon, more reddish below; a vertical, broad, reddish bar at the base of the tail, beyond which is a dark spot. Two brown radii, black-edged, extending backward and downward from the eye.

The body of this fish is covered with small scales, except on the jugular and abdominal regions, which are naked.

This fish is not very different from the *Xiphidium mucosum* of Girard. It differs in the smaller eye, the more remote origin of the dorsal fin from the head, the lack of anterior union of the mucous canals, and the coloration, &c., all according to Girard's description.

*CENTRONOTUS LÆTUS.* Cope, sp. nov.

Represented by two rather brilliantly colored specimens. They indicate a species allied to the *C. ornatus*, Girard,\* of which the Academy of Natural Sciences possesses numerous specimens from Puget's Sound, also from Prof. George Davidson.

Length of pectoral fin less than one-third that of head; eye, with diameter exceeding length of muzzle, and one-fifth length of head. Ventral fins very small. First dorsal spine above pectoral fin. Radii, D. 78; A. II, 38. Caudal fin not separated by a constriction from either the dorsal or the anal fins.

Length four inches, depth contained 8.5 times in it, a very little exceeding the length of the head.

Color roseate; the dorsal region and upper parts of head purple. There are 13 spots, which extend across the dorsal fin to the adjacent dorsal region, which were probably yellow, each bounded by parallel bars of

\* See United States Pacific Railroad Survey, X, p. 116, Tab. xxv.

brown. A yellow V-shaped band passes from the orbits to the occiput, and a purplish line descends from the orbit in front.

This fish differs from *C. ornatus* in the lack of distinctness of the caudal fin, the increased number of anal radii (there are 33 in *C. ornatus*), in the coloration, smaller size, &c.

*Chiridæ* (?)

*CHIRUS BALIAS*, Cope, sp. nov.

Dorsal fins nearly separated by a deep notch; a dentate dermal flap above each eye; scales cycloid on the posterior, ctenoid on the anterior part of the body. Lines of pores, five, two below the dorsal fin, one lateral, and two inferior, the lowest removed four scales from the anal fin and extending obliquely toward the median line of the belly in front of the vent. Radii, Br. V; D. XIX, 24; P. 19; A. 23. Head a little more than five times in the length, including caudal fin; latter 6.5 times in the same. Eye six times in length of head, a little more than half interorbital width. Lips very thick, equal; mouth descending obliquely, end of maxillary reaching anterior line of orbit. Caudal fin slightly convex. Scales 15—100—41.

Length of specimen, eighteen inches; greatest depth, one-fourth the same. Cheeks, opercula and vertex scaly.

Color dark leaden, with numerous large pale spots, which inosculate more or less without regularity. A pale band from orbit to angle of suboperculum, and another above it extending from the preoperculum to the angle of the operculum. Three or four curved lines of spots on the pectoral fin and its inferior rays, of the same light color. Gular and pectoral regions uniform and pale. First dorsal fin with two ill-defined pale areas, second dorsal pale between the radii, anal dark with elongate pale spots extending from the basis across the rays. Enlarged quadrate pale spots along the back at the basis of the dorsal fins. Ventral fins with few spots. From Captain's Harbor, Unalaska, obtained by Captain Harford.

This species must be related to the *C. lagocephalus* of Pallas.\* One difference which I observe is, that while the superior line of pores is wanting opposite to the second dorsal fin in that species, it is present in this for two-thirds of its length. That species is unicolor, this one marbled. I suspect that the pale markings of the *C. balias* were red in life.

*CHIRUS ORDINATUS*, Cope, sp. nov.

Dorsal fins not very elevated, continuous, but with a slight depression at the point of union of the two; a dentate flap above each eye; lateral lines of pores, five, only three of which extend to the basis of the caudal fin, viz., the second, third, and fifth. The first extends to opposite the middle of the second dorsal. The fourth commences below and in front of the basis of the pectoral, and extends to a point a little behind that measured by the extremity of that fin. The inferior series of opposite sides converge and unite a little behind the basis of the

\* Zoögraphia Russo-Asiatica, III, p. 277.

ventrals into a single median line, which extends to the branchiostegal fold. Radii, Br. VI; D. XIX, 25; C. 17. The interspaces scaled; the margin nearly truncate; A. 26; V. I, 5; P. 18. Head scaled above and on sides, except on interoperculum and muzzle. Scales ctenoid; 13—94—34. The scales are elongate and nearly truncate distally; on the sides they are in oblique series, but near the dorsal fin from three to five rows exhibit scales superposed vertically.

General color pale orange, with ill-defined blackish shade on the sides, and seven quadrate blackish spots at the base of the dorsal fin; below, bright yellow. Dorsal and caudal fin yellowish at base, margins with a broad blackish band; three black spots on the middle of the first, and four on the middle of the second dorsal fin; anal yellow, with seven blackish blotches extending anteriorly across the rays; pectoral yellow, with brown spots on the rays and a black one at the base in front; eye, with five blackish radii, diverging—two anteriorly, one upward and backward, one backward, and one downward and backward. Total length, fourteen inches; length of head entering it 4.33 times; depth of body, four times in the same; eye, five times in head, 1.66 times in muzzle, and 1.25 times in interorbital width.

This fine species is more nearly allied to the *Chirus hexagrammus*, Pall. but differs in numerous respects.

#### CHIRUS TRIGRAMMUS. Cope, sp. nov.

Established on a specimen of four inches in length, perhaps the young of a species more like the *C. ordinatus* in size. It is related to the latter in many points. There is a supraocular dermal flap, the dorsal fins are united but a rather deep notch separates them. The scales are ctenoid, not truncate, and are oblique-rowed up to the dorsal fin; numbers, 11—107—32; counted transversely at anal fin. Lines of pores three on the body, extending to the caudal fin; a series of pores without tubes, extending along the anterior half of the base of the first dorsal, and a short line of tubules extending from below the pectoral to the gill membrane. The abdominal series unite on the median line and extend to the gill-flap membrane, as in *C. ordinatus*. Radii, Br. V; D. XXIII, 21; A. 25; P. 20. Length of head, 4.75 in total. Diameter of eye, 3.66 times in head; length, equal interorbital width. Front scaly to near nares, opercula smooth. Depth 5.5 times in length.

Color light brown to lateral line proper; below it, golden. Seven quadrate brown dorsal spots; three quadrate black spots on each dorsal fin. Sides with an open marbling of brown bands, which connect the dorsal spots with some similar ones, which alternate with them, or forming a few open meshes. Inferior and caudal fins unspotted.

This species differs from the last in the deeper division and more numerous rays of the dorsal fin, the less-developed lines of mucous tubules, and the colorless anal and other fins. It is of less interest than the two already described. The latter probably play an important part in the domestic economy of the inhabitants of the Aleutian Islands and

Alaska as food-fishes, though on this point we must look for more information.

*Ammodytidae.*

This family differs from both the *Gadidae* and *Ophidiidae* in the *diphyccercal* tail with modified hæmal spines and centra; the scapular foramen is central.

AMMODYTES ALASCANUS. Cope, sp. nov.

Depth of body one-half length of head, entering nine and three-fifths times the total length, including caudal fin. Eye one-sixth of length of head, 2.2 times in head in front of it. Head 5.5 times in total length, Mandible elongate anal, quite prominent, less than depth of body. Dorsal radii, 62; and 31; former originating above middle of pectoral. Sides with the usual oblique dermal folds, 182 in number. A single latero-ventral dermal fold on each side. End of maxillary extending to line of front margin of orbit. Br. VII.

Length, six inches; above brown; middle of sides steel-blue; below silvery.

*Gadidae.*

GADUS PERISCOPUS. Cope, sp. nov.

The lower jaw a little longer than the upper, and the external teeth a little larger than the others in the latter. Vomerine teeth in a very small median patch with two larger oval patches, one on each side. Beard minute, not longer than half the diameter of the pupil of the eye. Profile of front obliquely descending from the elevated base of the dorsal fin. Eye large, 4.5 times in head, 1.5 in muzzle, and 1.2 in interorbital width. Radii, D. 13, 14, 19; A. 19, 19; ventrals with a short filamentous extremity; caudal fin a little concave. Vent below the space between the first and second dorsals. Head 4.33 times in total length; depth 5.33 times in the same. End maxillary to middle of pupil; pectoral fin to opposite last ray of first dorsal. Scales small, lateral line descending at front of second dorsal.

Length of type specimen, sixteen inches.

Color yellowish above, white below; superior fins and caudal dusky; pectoral dusky or black on the posterior face.

This cod-fish belongs to the section *Pollachius*, and is therefore quite distinct from the *G. vachna* of Pallas, of the Kamtchatkan Seas. It is also different in many respects from the *G. pygmaeus* of the same author, from near Cape Saint Elias.

GADUS AURATUS. Cope, sp. nov.

Upper jaw overhanging the lower; the external teeth a little the largest. Vomerine teeth in a single patch. Beard as long as the diameter of the eye. This is one-fifth the length of the head, and enters the interorbital width one and a half times. The profile descends very gradually, for the dorsal region is not elevated. End of maxilla opposite to the middle of the pupil. Length of head, 3.6 times in the total; depth of body four and two-third times in total length. A small acumination at the upper part of the opercular bone. Radii, Br. VII; D. 13, 16, 16;



A. 19, 16. Scales larger than in the last species, smaller on the cheeks and top of head. Vent below anterior rays of second dorsal. Pectoral not quite reaching line of last ray of first dorsal. Ventrals a little produced. Caudal slightly concave.

Length of type, thirteen inches.

Sides and above, brown; lower surfaces and upper jaw, golden yellow. Superior and caudal fins, brown; the first dorsal with a median angular yellow band, which terminates at the base of the last rays in a yellow spot. Concealed surfaces of pectoral and ventral fins, dusky.

In the *Gadus vachna*, according to Pallas, the number of radii in both the last dorsal and last anal fins is greater than in *Gadus auratus*; the depth of the body and length of head are represented by Pallas as the same, while here the head greatly exceeds that dimension.

*Gadopsidæ.*

Günther's Catalogue of Fishes, British Museum, IV, p. 318.

In adding a new genus to this family, I call attention to the probable position of the latter in relation to others. Dr. Günther places it among the *Anacanthini*, preceding the *Lycodidæ*, while Dr. Steindachner has expressed the opinion that the genus *Gadopsis* of Richardson should be referred to the *Blenniidæ*, or near them.

On examination of the new genus *Bathymaster*, I observe that the superior pharyngeal bone do not present the type of the *Scyphobranch* division of *Percomorphi*, to which the *Blenniidæ* belong, but resemble some of the *Gadidæ* in this respect. On the other hand, the large pseudobranchii are much like those of the *Blenniidæ*. The dorsal spines are so few and soft as to count for nothing, as they scarcely differ from the fissured rays which follow them. The pyloric cæca are like those of the *Gadidæ*. The structure of the scapula I cannot determine, but the basis of the caudal fin is like that of the diphycercal families. This would not, however, prevent the association of the family with the *Anacanthini* as left by Dr. Günther.

BATHYMASTER SIGNATUS. Cope, *genus et species novæ.*

*Character genericus.*—From elongate; a long dorsal fin well separated from caudal, which possess only four or five unbranched rays as its anterior extremity. Vent submedian, anal fin elongate, spineless, well distinguished from the caudal. Caudal rounded. Ventral fins pectoral, of one spine and five rays; scales ctenoid. Lateral line well developed, single; no isthmus; no beard of any kind. Teeth simple, in a band on the premaxillary, the outer series the largest; on the dentaries only many-rowed near the symphysis, where the inner are largest. A narrow series of vomerine and palatine teeth.

The caudal fin having become separated, I observe that it is supported by the usual modified hæmapophyses with aborted centra, and is not isocercal as in the *Anacanthini* generally.

Pyloric appendages in small number. Branchial arches four, with a fissure behind the fourth; a large pseudobranchus.

The characters which separate this genus from *Gadopsis* are many. The pectoral ventrals with five rays and the large pseudobranchiæ are among the most marked. In the former point it is less, in the latter more like the *Blenniidae*; on the side of the *Anacanthini* its form is most like that of *Brosomphycis*, Gill, which, however, has the ventrals much reduced.

Lateral line not flexed nor interrupted, dorso-lateral. Eye large.

*Character specificus*.—Body gradually contracting from the anterior part of dorsal fin. Head broad, but narrowed above; muzzle descending rather abruptly. Eye very large, equal length of muzzle, 3.66 times in length of head to apex of bony operculum, beyond which extends a considerable dermal flap. Length of head four times in the total, exclusive of caudal fin. Depth 5.1 in the same. Dorsal and anal fins not very elevated, the rays of both about 1.5 times the length of the eye's diameter. Radii, Br. VI; D. 47; A. 34; P. 20, the inferior rays much subdivided distally. Lateral line following dorsal outline; numerous lines of mucous pores with short tubules on the head. Scales, 9—101—30. A band from the top of the head to the first dorsal ray naked; jugular region scaled. The dorsal fin originates above the bony angle of the operculum much in advance of the basis of the pectoral, while the origin of the ventrals marks a point between the two. Four pyloric cæca. Total length, twelve inches. Color, a dark leather-brown everywhere, with some purple reflections on the head. Anal fin, dark purplish. A deep black spot crossing the extremities of the webs and first five spines of the dorsal fin. Extremities of the lower pectoral rays blackish.

From near Sitka, Alaska.

The large eye of this species renders it probable that it inhabits considerable depths of the ocean. The discovery of this species, due to Mr. Davidson, is the most important result of his investigation in this field, bringing to light, as it does, a *high* northern representative of a form supposed hitherto to be confined to the fresh waters of Tasmania and Australia.

*Pleuronectidæ.*

PLEURONECTES PERARCUATUS. Cope.

Teeth obtusely conical. Lateral line strongly curved in front, the width of the arch nearly half its length and nearly twice the width of the basis of the pectoral fin. Scales ciliated, not spiny, 91 on the lateral line; head scaly. Front between orbits very narrow, keeled. Inferior orbit a very little in advance, 4.66 times in head, a little larger than the muzzle. A short lateral line along the basis of the dorsal fin, its posterior terminus opposite the origin of the real lateral line. Under jaw longer than upper, maxillary reaching to anterior line of orbit. Length of head 3.5 times in length without caudal fin, depth of body 4-9ths of the same. Radii, D. 74; A. 59—60. Length, six inches.

Color, reddish-brown, unspotted. Fins, dusky; a series of rather large, very faint spots on the dorsal fin.

This flat-fish belongs to the group *Platichthys* of Girard. It is near his *P. umbrosus*, but has more anal radii and scales, a more strongly curved lateral line, and lacks the interorbital tubercles, &c.